

REMARKS/ARGUMENTS

Claims 1-16 are pending in the application. Independent claims 1, 4, and 11 have been amended to more particularly point out and claim the invention. Support for the amendment of claims 1, 4 and 11 is found in WO 01/21353 (publication of the parent PCT application) at page 9, line 13 through page 10, line 17, and in Figures 3, 4 and 5. Claim 3 has been amended to remove unintended language and to address a rejection under 35 U.S.C. §112. Claim 9 has been amended to eliminate a multiple dependency. Claims 2,4, 9, 10, and 13-16 have been amended to properly recite antecedents. The abstract has been amended to remove legal phraseology and to address an objection. No new matter has been added by these amendments.

Objections to the Abstract

The Examiner objected to the abstract for inclusion of the word “means” in the abstract. The abstract has been amended to delete the word “means”. In view of the amendment to the abstract, Applicant respectfully requests that the objection to the abstract be withdrawn.

Claim Rejections – 35 U.S.C. §112 – Claim 3

The Examiner has rejected claim 3 under 35 U.S.C. §112, second paragraph. The Examiner states that the phrase “either of” in claim 3 is unclear. Applicants have amended claim 3 to delete the phrase “either of”. In view of the amendment, Applicants respectfully submit that claim 3 is in full compliance with the requirements of 35 U.S.C. §112, and respectfully request that rejection of claim 3 under 35 U.S.C. §112, second paragraph be withdrawn.

Claim Rejections – 35 U.S.C. §102 – Claims 1, 2, 4, 6, 7, 8, 9, 11, 14, 15, and 16

Claims 1, 2, 4, 6, 7, 8, 9, 11, 14, 15 and 16 have been rejected as allegedly anticipated under 35 U.S.C. §102(b) by European Patent Application Publication EP 0 679 469 A1 (Sasagawa *et al.*, hereinafter, “Sasagawa”). In order for a prior art reference to be anticipating, it must disclose each and every element set forth in the claim. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP § 2131. Applicants respectfully traverse rejection of claims 1, 2, 4, 6-9, 11, and 14-16, as Sasagawa does not disclose each and every element of the claims, as amended.

Independent claim 1 is directed to a laser apparatus for use in material processing of a workpiece. Independent claim 4 is directed to a laser conditioning apparatus for use in material

processing of a workpiece. Independent claim 11 is directed to a method of manufacturing a phase filter for use in a laser material processing apparatus. Claims 1 and 4, as amended, each recite, *inter alia*:

... a desired intensity distribution of light incident on the workpiece which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the apparatus in the absence of the filter.

Claim 11, as amended, similarly recites, *inter alia*:

... a desired intensity distribution of light incident on a workpiece which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser material processing apparatus in the absence of the filter;... .

Claims 1, 4, and 11 have been amended to more particularly point out and claim the invention. Specifically, claims 1, 4, and 11 have been amended to recite that the intensity distribution of light **extends in at least a spatial dimension parallel to the optical axis**. Support for these amendments is found in WO 01/21353 (publication of the parent PCT application) at least at page 9, line 13 through page 10, line 17, and in Figures 3, 4 and 5. In particular, Figures 3-5 graphically illustrate specific patterns of light intensity distribution variation extending along the optical axis (the "Z" axis). Thus, with the present invention the intensity along the beam varies in the desired manner. This contrast with all of the cited prior art in which it is the intensity distribution in a plane orthogonal to the beam that is varied. To put it another way, the prior art only teaches varying the pattern in an x-y plane, not the intensity along the beam.

Sasagawa discloses a laser machining apparatus comprising a generating unit (5) for simultaneously generating a plurality of laser beams (11), each having a beam pattern shaped by a shaping unit (6). The generating unit (5) is disclosed to be Fourier-transform hologram and the shaping unit (6) is disclosed to be a mask. The hologram (5) serves to divide the incident laser beam, from which a number of transferred images are generated. The hologram (5) further serves to distribute the divided laser beams as transferred images at predetermined positions on a target (8). Sasagawa, page 14, lines 27-29. The plurality of images generated by the hologram

are copies of a “basic” image that would otherwise form on the target surface in the absence of the hologram. This is clearly set forth in Sasagawa on page 14, lines 13-26.

“The mask 6 is an element for allowing a component of the incident laser light with a desired pattern to be machined to pass therethrough. The shaped pattern is imaged on the target 8 to be machined after it is expanded or reduced in size by the transferring optical system with the transferring lens 7 and is passed through the hologram 5. Therefore, the basic pattern is a basic element of the whole pattern to be machined on the target 8.”

Furthermore, Sasagawa discloses that the “basic” and “copy” images are focused onto the same plane by a transferring lens 7. Sasagawa, page 17, lines 19-29; page 19, lines 11-16; and the drawings (for example, Figs. 5 and 6), which disclose only a planar target surface 8. In short, Sasagawa discloses a mask 6 used to create a desired pattern of illumination in a plane perpendicular to the optical axis and a hologram 5 used to multiply that pattern (also in a plane perpendicular to the optical axis), so that the desired pattern can be machined at multiple locations on a planar target 8. Sasagawa, page 14, lines 13-37, Figs. 5 and 6.

Sasagawa does not disclose each and every feature of the invention. With respect to independent claims 1, 4, and 11, Sasagawa does not disclose at least the feature of a desired intensity distribution of light which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser material processing apparatus in the absence of the filter.

Furthermore, Applicants note that as the light intensity of a “basic” image is divided by the hologram of Sasagawa, each of the “copy” images must necessarily have a smaller intensity distribution than that of the “basic” image. Applicants also note that it is impossible for the “copy” images, which lie in the same focal plane as the “basic” image, to have an intensity which extends beyond that of the “basic” image in a direction perpendicular to the focal plane (that is, in a direction parallel to the optical axis). Thus, Sasagawa not only fails to disclose the feature of a intensity distribution of light which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser material processing apparatus in the absence of the filter, indeed the device of Sasagawa is not capable of providing the recited feature of claims 1, 4, and 11.

Because Sasagawa does not disclose each and every feature of claims 1, 4, and 11, these claims are not anticipated by Sasagawa. The phase filter of the present invention enables the

light intensity to be distributed over three dimensions, rather than the two dimensions provided by the apparatus described in Sasagawa. None of the prior art cited alone or in combination, teach or suggest an apparatus capable of distributing a light intensity beyond that of the "basic" focused spot in a direction parallel to the optical axis. Accordingly, it is further submitted that the claims of the present invention are inventive.

Claims 2, 9, and 14-16 are also not anticipated by Sasagawa at least by their dependency upon claim 1. Additionally, with particular reference first to claim 14, Applicants respectfully submit that Sasagawa further fails to disclose each region of a filter having phase shifts of either 0 or π radians. The Examiner has pointed to page 6, lines 27-30 of Sasagawa as disclosing this feature recited in claim 14. However, Sasagawa at page 6, lines 27-30 states:

... machined, for guiding the laser beam emitted by the laser light source. The laser light emitted by the laser light source is guided by the optical fiber and the laser light with the shaped beam pattern is emitted out of the emergent face which is shaped like the beam pattern. Therefore the laser transfer machining apparatus provides a high efficiency of utilization of laser light and the light intensity distribution of the laser light... .

Applicants respectfully submit that this passage of Sasagawa does not disclose the feature recited in claim 14 of each region of a filter having phase shifts of either 0 or π radians.

With particular reference next to claims 15 and 16, in the rejection the Examiner has not identified specifically where in Sasagawa the recited features of claims 15 and 16 are disclosed. Applicants respectfully submit that the features recited in claims 15 and 16 are not disclosed in Sasagawa.

Claims 6, 7, and 8 are also not anticipated by Sasagawa at least by their dependency upon claim 4. Additionally, with respect to claim 6 (and as discussed above relative to claim 14), Applicants respectfully submit that Sasagawa further fails to disclose each region of a filter having phase shifts of either 0 or π radians. Also, with particular reference to claims 7 and 8 (and as discussed above relative to claims 15 and 16), the Examiner has not identified specifically where in Sasagawa the recited features of claims 7 and 8 are disclosed. Applicants respectfully submit that the features recited in claims 7 and 8 are not disclosed in Sasagawa.

Applicants respectfully submit that claims 1, 2, 4, 6, 7, 8, 9, 11, 14, 15, and 16 are not anticipated by Sasagawa, and request that the rejection of these claims under 35 U.S.C. § 102(b) be withdrawn.

Claim Rejections – 35 U.S.C. §103, Claims 5, 9, and 13

Claims 5, 9, and 13 have been rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Sasagawa in view of U.S. Pat. No. 6,011,874 (Gluckstad). To establish a *prima facie* case of obviousness, all of the elements of a claim must be disclosed, taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974); MPEP § 2143.03. Applicant respectfully traverses rejection of pending claims 5, 9 and 13, as Sasagawa and Gluckstad are not properly combinable, and even if combined, the proposed combination of Sasagawa and Gluckstad does not disclose, teach or suggest all of the elements of these claims.

Claim 5 depends directly from claim 4. Claim 9 has been amended to depend from claim 1, and is no longer dependent upon multiple claims. Claim 13 depends from claim 1.

Gluckstad discloses a method for synthesizing an intensity pattern with a low loss of electromagnetic energy using spatial modulation of electromagnetic radiation with a spatial phase mask.

The rejection of claims 5, 9, and 13 is first traversed on the grounds that the proposed combination is unsupported. Gluckstad is not properly combinable with Sasagawa under U.S.C. § 103(a) to render claims 5, 9, and 13 obvious. It is well settled that when making a rejection under 35 U.S.C. § 103(a), the Examiner has the burden of establishing a *prima facie* case of obviousness. The Examiner can satisfy this burden only by showing an objective teaching in the prior art, or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the teachings of the references in the manner suggested by the Examiner. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Applicants respectfully submit that the proposed combination is improper, as there is no teaching, suggestion, or motivation for the proposed combination in either the references themselves or in the knowledge generally available to the artisan.

Without a basis to show that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the

cited prior art references for combination in the manner claimed, the invention is not obvious. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-8 (Fed. Cir. 1998).

One skilled in the art considering the problem of generating a plurality of images using a hologram optical element as disclosed by Sasagawa would not be motivated to look to the imaging technique of Gluckstad. Severance of an element, or elements, from a reference without regard to the context of the disclosure as a whole is improper. The test for obviousness is not whether the features of one reference may be bodily incorporated into another reference. Rather, one should look to see whether the combined teachings is suggested in the references.

Sasagawa does not disclose, teach, or suggest that the ability to quickly change the shape of the wavefront reaching the target would be desirable. Further, the artisan, with the disclosures of Sasagawa and Gluckstad before him or her would not recognize a motivation to combine the spatial light modulator of Gluckstad with the laser machining apparatus of Sasagawa. As the Examiner has failed to show why the artisan would be motivated to select the elements from the cited prior art references for combination in the manner claimed, the proposed combination of references is improper.

Even if Gluckstad were combinable with Sasagawa, Applicants further traverse the rejection of claims 5, 9, and 13 because the proposed combination of references would not disclose each and every feature of the present invention as claimed. Sasagawa and Gluckstad, both individually and in the proposed combination, fail to disclose at least the feature recited in both independent claim 1 and independent claim 4 of a desired intensity distribution of light which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser material processing apparatus in the absence of the filter. As Sasagawa and Gluckstad fail to teach, disclose or suggest all of the elements of claims 1 and 4 of Applicants' invention, Applicants respectfully submit that a *prima facie* case for obviousness has not been established with respect to claims 1 and 4 nor with respect to claim 5 depending from claim 4 nor with respect to claims 9 and 13 depending from claim 1. Accordingly, it is requested that the rejection of claims 5, 9, and 13 under 35 U.S.C. § 103(a) be withdrawn.

Claim rejections – 35 U.S.C. §103, Claims 10 and 12

Claims 10 and 12 have been rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Sasagawa in view of U.S. Pat. Application Publication No. 2001/0050787 (Crossland *et al.*,

hereinafter "Crossland"). Applicants respectfully traverse rejection of claims 10 and 12 based on these references, as Sasagawa and Crossland do not, either alone or in the proposed combination, teach, suggest, or disclose each and every element of the claims, as amended.

Crossland discloses an electro-optical component having a reconfigurable phase state. The component comprises a substrate, a phase-variable element carried on the substrate, a memory carried on the substrate for storing data representative of a phase state for the phase-variable element, and a controller carried on the substrate. The component is preferably used to provide an optical switch.

Applicants traverse the rejection of claims 10 and 12 because the proposed combination of references would not disclose each and every feature of the present invention as claimed. Sasagawa and Crossland, both individually and in the proposed combination, fail to disclose at least the feature recited in both independent claim 1 and independent claim 11 of a desired intensity distribution of light which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser material processing apparatus in the absence of the filter. As Sasagawa and Crossland fail to teach, disclose or suggest all of the elements of claims 1 and 11 of Applicants' invention, Applicants respectfully submit that a *prima facie* case for obviousness has not been established with respect to claims 1 and 11 nor with respect to claim 10 depending indirectly from claim 1 nor with respect to claim 12 depending directly from claim 11. Accordingly, it is requested that the rejection of claims 10 and 12 under 35 U.S.C. § 103(a) be withdrawn.

Claim rejections – 35 U.S.C. §103, Claim 10

Claim 10 has been rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Sasagawa in view of Gluckstad in further view of Crossland. Applicants respectfully traverse rejection of claim 10, as Sasagawa, Gluckstad, and Crossland, either alone or in the proposed combination, do not disclose each and every element of claim 10. In particular, Sasagawa, Gluckstad, and Crossland each fail to disclose at least the feature recited in independent claim 1 of a desired intensity distribution of light which extends in at least a spatial dimension parallel to the optical axis beyond the focused spot produced by the laser apparatus in the absence of the filter. As Sasagawa, Gluckstad, and Crossland fail to teach, disclose, or suggest all of the elements recited in claim 1 of the Applicants' invention, Applicants respectfully submit that a

prima facie case of obviousness has not been made with respect to claim 1 or to claim 10 depending from claim 1, and Applicants respectfully request that the rejection of claim 10 under 35 U.S.C. § 103(a) be withdrawn.

Allowable Subject Matter

Applicants acknowledge with appreciation that claim 3 (along with claims 9 and 10 depending from claim 3 prior to the current amendment) has been found to be allowable if rewritten in independent form. However, in view of the foregoing comments, Applicants respectfully request reconsideration of claim 3 in its original dependent form.

CONCLUSION

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-16, is in condition for allowance, and such action is respectfully requested.

If direct communication will expedite the allowance of the application, the Examiner is invited to telephone the undersigned attorney for Applicants.

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